

What Is Claimed Is:

1. An optical switching device having a plurality of optical input ports and a plurality of optical output ports, comprising:

5 a plurality of optical reflection monitors for monitoring optical reflection, disposed between the plurality of input ports and the plurality of output ports.

2. The optical switching device according to claim 1, wherein the optical reflection monitors detect reflected light on a path transmitting an optical signal input to the optical switching device, and locate positions of reflection on the paths.

3. An optical switching system configured by multistage-connecting a plurality of optical switching devices, wherein the optical switching device comprises a plurality of optical reflection monitors with an optical reflection monitoring function, the optical reflection monitors detecting reflected light on a path transmitting an optical signal input to the optical switching device, and locating positions of reflection on the path.

4. The optical switching system according to claim 3, wherein each of the optical reflection monitors comprises an optical branching circuit that separates the optical signal or the reflected light, and an optical detector that monitors the optical signals or the reflected light.

5. The optical switching system according to claim 3, wherein the optical reflection monitors comprise an optical

isolator that passes only the optical signal and blocks the reflected light; an optical branching circuit that separates the reflected light of the optical signal; and an optical detector that monitors the reflected light.

5 6. The optical switching system according to claim 3, wherein the optical reflection monitors comprise an optical circulator that allows the passage of the optical signal and circulates or blocks the reflected light of the optical signal, and an optical detector that monitors the reflected light.

10 7. A reflected light measuring system, comprising a terminal provided with optical reflection measuring software; an optical switching system with an optical switching unit that controls switching of optical signals; a reflected light meter that measures reflected light of the optical signals; and a port selector that selects an optical signal input path to the optical switching unit; wherein the terminal is operable by executing the software, to control the operation of the reflected light meter, the port selector, and the optical switching unit, to measure the reflected light of the optical signals, and locate
15
20 the reflecting positions.

25 8. The reflected light measuring system according to claim 7, wherein the terminal is a portable personal computer; the reflected light meter includes a control and monitoring unit that monitors the reflected light, a light source including a laser diode, and an optical detector that detects the reflected

light; the port selector includes a selector that selects ports for optical signals and a control unit that controls the selectors; and the optical switching system includes a system control and monitoring unit and optical switching units.

5 9. The reflected light measuring system according to claim 8, wherein the system control and monitoring unit includes a switching information memory unit that stores information about switched paths of the optical switching unit, and an optical reflection alarm information memory unit that stores reflected light alarm and other types of information transferred from the reflected light meter.

10 10. The reflected light measuring system according to claim 8, wherein the software is storable not only in the terminal but also in the control and monitoring unit in the reflected light meter and/or in the system control and monitoring unit in the optical switching system.

15 11. An optical switching method enabling detection of reflected light, the method comprising the steps of:

20 making a setting for switching an optical switch and storing optical interconnection relationships;

 making a selection of a circuit board on which optical switching devices are mounted according to a command from an operation control unit and storing an optical reflection alarm information; and

25 locating positions of reflection according to the optical

interconnection relationships and the optical reflection alarm information being stored.

12. The optical switching method according to claim 11, wherein the step of storing the optical interconnection relationships includes steps of transmitting a switching command to multistage-connected optical switching devices according to a command from an operation control unit; after completing the necessary settings for switching of the optical switching devices, updating the contents of the optical interconnection relationships being stored based on switching information transferred from the optical switching device.

13. The optical switching method according to claim 11, wherein the step of storing the optical reflection alarm information includes steps of transferring the optical reflection alarm information from the optical switching device to the operation control unit after transmitting an optical reflection alarm acquisition request to the optical switching device mounted on the selected circuit board by the CPU; and updating the contents of the optical reflection alarm information being stored based on the optical reflection alarm information by the CPU.

14. The optical switching method according to claim 11, wherein the step of locating the positions of reflection includes steps of detecting an alarm position according to the optical reflection alarm information that has been stored, when optical

reflection alarm information is present; searching the optical interconnection relationships being stored; selecting a suspected abnormal optical interconnection path; and after determining a rearmost connection among interconnected points at which reflected light occurs, notifying the operation control unit of the rearmost connection.

15. A method of setting switching information and optical reflection alarm information in the optical switching device, the method comprising the steps of:

performing a settings for switching of optical switches and setting a switching information register by a switching control unit in an optical switching device; and

after selecting an optical reflection monitor circuit by the CPU, performing A/D conversion of a monitored signal from the optical reflection monitor circuit, transferring the converted monitored signal to a monitoring and control unit, and setting an optical reflection monitoring register therein.

16. The method according to claim 15, wherein the step of performing a setting includes a step of setting the optical switch switching information into the switching information register.

17. The method according to claim 15, wherein the step of setting an optical reflection monitoring register further includes the step of setting the optical reflection monitoring register so that a comparison is made between the A/D converted

monitored signal value and a threshold stored in the monitoring and control unit for use in processing; writing a "1" into a memory in the monitoring and control unit is made to indicate an abnormal condition when the monitored signal value is smaller than the threshold; and writing a "0" into the memory is made to indicate a normal condition when the monitored signal value is larger than the threshold.

18. A method of measuring an optical reflection position in an optical switching unit by using an optical reflecting measuring system, comprising the steps of:

transmitting a switching command to a port selector under control of a portable terminal;

transmitting the switching command to the optical switching unit under control of the portable terminal;

requesting acquisition of a reflected light measurement value by a reflected light meter; and

searching an optical reflection alarm control table and an interconnection control table and locating an abnormal alarm position.

19. The method according to claim 18, wherein the step of requesting acquisition of the reflected light measurement value further includes steps of comparing the reflected light measurement value transferred from the reflected light meter with a threshold stored in an optical reflection alarm information memory in a control and monitoring unit; and updating the optical

reflection alarm information memory by writing a "1" into a memory in the monitoring and control unit to indicate an abnormal condition when the reflected light measurement value is smaller than the threshold and by writing a "0" into the memory to indicate normality when the reflected light measurement value is larger than the threshold.

20. The method according to claim 18, wherein the step of locating an abnormal alarm position includes the steps of searching the optical reflection alarm control table and detecting an alarm position when information stored in the optical reflection alarm information memory indicates an abnormal condition, further includes the steps of searching the interconnection control table; selecting an interconnection with a suspected abnormal optical fiber; and determining a rearmost connection among interconnected positions at which reflected light occurs.

21. An optical switching device comprising optical reflection monitors each having a plurality of optical reflection functions disposed between a plurality of optical input ports and a plurality of optical output ports, for monitoring reflected light arising at certain positions on optical transmission paths provided between the plurality of optical input ports and the plurality of optical output ports for the optical signal input via the optical input port, thereby enabling immediate notification of abnormal conditions in optical connection cables

on the optical transmission paths.

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